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MEMOIRS

OF THE

GEOLOGICAL SURVEY

OF

THE UNITED KINGDOM.

Figures and Descriptions

ILLUSTRATIVE OF

BRITISH ORGANIC REMAINS.

DECADE IV.

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1852.

BRITISH FOSSILS.

DECADE THE FOURTH.

All the plates and descriptions in this Decade are devoted to fossil Echinodermata of the order *Echinoidea*.

The genera selected for illustration are *Temnechinus*, *Acrosalenia*, *Hyboclypus*, *Hemipneustes*, *Ananchytes* with its section *Holaster*, and *Cardiaster*. The geological age of the first is Upper Tertiary, of the second and third Oolitic, of the remainder Cretaceous. Several of the species are represented for the first time.

Temnechinus is a genus remarkable for its species being at present known only as fossils of the Coralline and Red Crags; it is now characterized for the first time.

The examples of *Acrosalenia* selected are both remarkable for their beauty and their very perfect condition. They are also of much interest, one on account of the rectification of its true generic position, which I have been enabled to make through the aid afforded by very perfect specimens: the other, because of the complete preservation exhibited by the specimens described of parts too often lost in fossil Echinoderms. I have appended to the descriptions of these *Acrosaleniæ* brief characters of some new species of this interesting oolitic genus.

Hyboclypus is illustrated by the finest and largest species of the genus, one discovered during the researches of the Geological Surveyors.

Hemipneustes, to which genus I unite *Toxaster*, is now for the first time authentically represented by a British example, remarkable for its novelty and for the light it throws upon the mutual affinities of those genera of *Echinoidea* which have excentric mouths.

The well known genus *Ananchytes* is combined (as indeed it was formerly by Lamarck) with *Holaster*. In selecting the common *Ananchytes ovata* of the Chalk for the subject of a plate and description, I have been influenced by the necessity of clearing up the confused synonymy of this fine fossil, and of settling the numerous spurious species which have been constituted out of its varieties, or from imperfect figures contained in old works.

Cardiaster is a new genus, lately constituted by myself for some remarkable and interesting sea-urchins, intermediate in their characters between *Ananchytes* and the true *Spatangidæ*. To the account of the species figured I have added notices of all the forms of this curious type which are known to me as British.

EDWARD FORBES.

October, 1852.

BRITISH FOSSILS.

Decade IV. Plate II.

ACROSALENIA HEMICIDAROIDES.

[Genus ACROSALENIA. Agassiz. (Sub-kingdom Radiata. Class Echinodermata. Order Echinoidea. Family Echinidæ.) Body spheroidal, usually depressed; ambulacral and interambulacral segments developed, the former bearing two rows of small secondary tubercles, the latter two rows of unequal large primaries; tubercles perforate, and placed on crenulated bosses. Anus excentric, included within the apical disk, which is formed of five genital and five ocular plates, with one or more supplementary central plates. Ambulacral avenues with the pairs of pores falling into single file above and on the sides, and becoming distinctly three-ranked near the mouth.]

Reference. *Acrosalenia hemicidaroides.* Wright, in Annals and Mag. of Nat. Hist., 2d ser. vol. viii. p. 161. pl. xi. fig. 1. (1851.)

Diagnosis. *A. ambulacris angustis, tuberculis parvis approximatis alternatis ornatis; interambulacris tuberculis primariis conspicuis, ad latera magnis, superne parvis, areolis subconfluentibus; areâ centrali angustissimâ, granulatâ, granulis biseriatis.*

This, one of the most beautiful and best preserved of British Oolitic Sea-Urchins, has been for some years a well known ornament of collections, but received no specific appellation until it was described and figured in 1851 by Dr. Wright of Cheltenham, in his excellent memoir on the *Cidaridæ* of the Oolites.

The body is spheroidal, depressed above, usually considerably so, but not always. At first glance its most striking features are the large size and fewness of the interambulacral tubercles and their bosses, whilst those on the ambulacra are very small and but slightly spaced out. The interambulacral segments are centro-laterally thrice the breadth of the ambulacral ones, and are somewhat prominent. The latter are narrow, gently and gradually widening in the upper portion of their lower half, and exhibit a slightly undulating contour; they bear two rows of very small, nearly equal, and prominent secondary tubercles, each row consisting of (in large specimens) about 16, all of them perforated and placed upon bosses, each of which exhibits about 10 crenulations.

These ambulacral tubercles are separated from each other by narrow and irregular rows of granules, and are so arranged, in consequence of being closely set, that the tubercles of each row alternate. The ambulacral segments are each composed of two series of six or seven plates, each plate bearing a primary tubercle. The two plates nearest the mouth bear small ones; those of the sides very large ones, and those near the apical disk small ones. The tubercles are elevated on very prominent bosses (to the size of which their apparent dimension is chiefly due), around whose bases there is a broad smooth areola. The tubercles are perforate; the summits of the bosses crenulate; the number of crenulations ten or more. The areolæ are confluent, separated by a single line of minute granules. Alternations of minute secondary tubercles and small granules closely set form a narrow border to the ambulacral and interambulacral margins of each plate. Thus the medial region of each interambulacral segment becomes ornamented by a sinuous line of irregular secondary granules, two abreast, except above, where they become rather more numerous, until near the genital disk they become scattered or obsolete. Their number is slightly increased in the ambulacral margins of the interambulacral plates near the mouth. The mouth is wide, usually equalling in width the height of the test. Its margins are decagonal in consequence of ten deep notches with reflected edges that indent in pairs the buccal extremities of the interambulacral segments. The interspaces of these notches describe arches; those of the ambulacral segments being widest. The avenues of pores are very slightly sinuous; above, they are in strict single file; near the mouth they fall into two or three somewhat irregular curved ranks of three pairs in each. There is a small swelling or granule separating the pores of each pair.

The apical disk is wide and slightly convex; it occupies about a third of the diameter of the test. It is slightly pentagonal in consequence of the projection of the genital plates. These are large and escutcheon-shaped, except the posterior one, which is contracted in consequence of the excentric and posteal position of the vent, of which it forms one of the bounding plates. The genital orifices are placed not far from their outer margins. The right antero-lateral genital plate bears the madreporiform tubercle, indicated by a porous subcentral space. The eye plates are large, but the ocular pores are concealed in sub-marginal depressions. The centre of the disk is occupied by from four to six supra-anal

plates, or it may be regarded as composed of one plate broken up into several elements. All the plates of the genital disk bear scattered granules.

The primary spines are variable in size in the same and in different specimens. They are shorter in young examples than in old ones. In some before us, the largest spines are three times as long as the diameter of the test. To the naked eye they seem smooth, but under the lens are seen to be obsoletely and finely striated longitudinally. They are more or less irregularly angular; the angles rounded; in section they are irregularly elliptical. They are broadest in their lower half, tapering upwards, and terminating in a single, bifid, or trifid extremity. The ring round their bases is narrow, elevated, and strongly crenulated. The neck is very short, and the margin of the articular socket is strongly crenulated also.

The secondary spines are very small, regular, round, and striated.

The dental-lantern is strongly developed, and often well preserved. It bears a close resemblance to that of *Echinus*.

The following table shows the comparative dimensions of three specimens selected on account of their differences:

	Elevated form.	Depressed form.	Ordinary small example.
Diameter of test - -	1 inch.	$1\frac{1}{10}$ inch.	$0\frac{6}{10}$ inch.
Height of test - -	$0\frac{5}{8}$ „	$0\frac{1}{2}$ „	$0\frac{4}{12}$ „
Diameter of mouth - -	$0\frac{1}{2}$ „	$0\frac{1}{2}$ „	$0\frac{4}{12}$ „
Diameter of apical disk -	$0\frac{3}{8}$ „	$0\frac{4}{12}$ „	$0\frac{3}{10}$ „

The largest specimen in the Museum of Practical Geology measures one inch and one-twelfth in diameter, and has spines three inches and five-twelfths in length. The longest secondary spine upon it measures one-fourth of an inch.

Locality and Geological Position. The finest examples of this beautiful fossil were found by William Buy, an acute collector, in the Forest Marble near Malmesbury and Chippenham. We have it also from the same rock at Hinton Abbey, where it was collected by Mr. Pratt. Mr. Bristow has found a tumid variety of it in the Cornbrash near Wincanton. We have a group of specimens said

to be from the Coral rag at Calne. Dr. Wright states that he has collected it in the upper beds of the Inferior Oolite at Leckhampton, and that the Rev. P. B. Brodie has found it in the same stratum at Selsley Hill; also that it is found in the Great Oolite at Minchinhampton, and at Kiddington in Oxfordshire.

Explanation of Plate II.

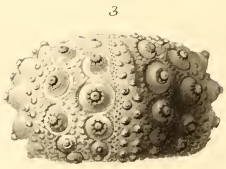
Fig. 1. Body of the *Acrosalenia hemicidaroides* seen from above.
Fig. 2. The same seen from below, and showing the mouth.
Fig. 3. An elevated example, seen from the side.
Fig. 4. A specimen in which the dental lantern is preserved.
Fig. 5. Apical disk, with its constituent plates and posteal anus.
Fig. 6. Part of the ambulacral and interambulacral segments, taken from the side.
Fig. 7. Portions of the same segments from beneath, showing the three-ranked pairs of pores in the vicinity of the mouth.
Figs. 8. 9. and 10. Primary spines of the natural size.
Fig. 11. The base of one of the primary spines magnified.
Figs. 12. and 13. Sections of primary spines magnified.
Fig. 14. Plan of the base of a primary spine, showing the crenulations surrounding the socket and a second series above the neck.
Fig. 15. A secondary spine highly magnified.
Fig. 16. One of the interambulacral tubercles seen in profile, elevated on its crenulated boss, the sides of which are slightly excavated and the base surrounded by an areola.
Fig. 17. Portion of the dental apparatus.

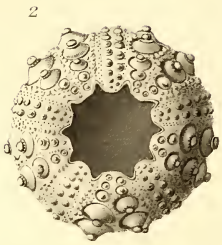
Edward Forbes.

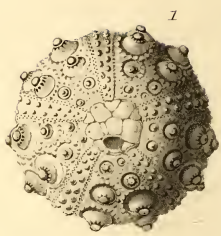
October, 1852.

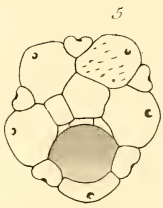
Geological Survey of the United Kingdom.

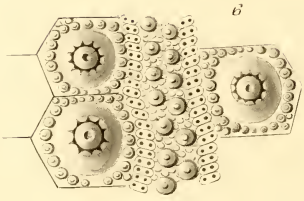
ACROSALENIA
(Oolitic)

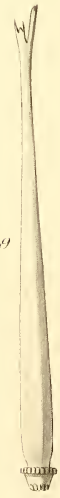


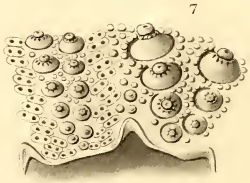


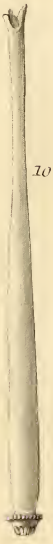


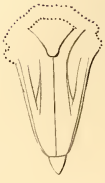












ACROSALENIA HEMICIDAROIDES — *Wright.*